Sept. 15, 1942. F. E. VALOIS ET AL 2,295,880

LAWN SPRINKLER

Filed Nov. 12, 1940 3 Sheets-Sheet 1

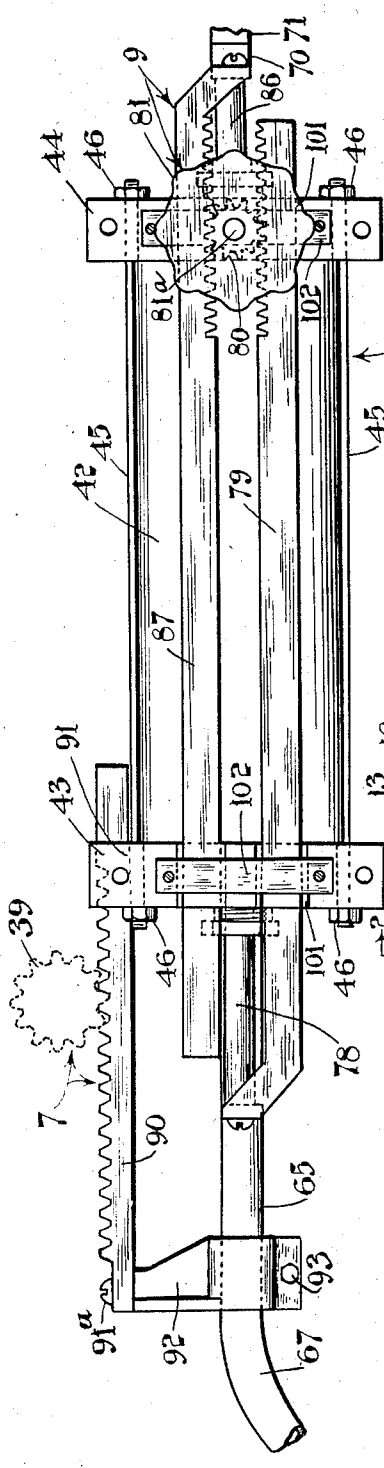


FIG. 4

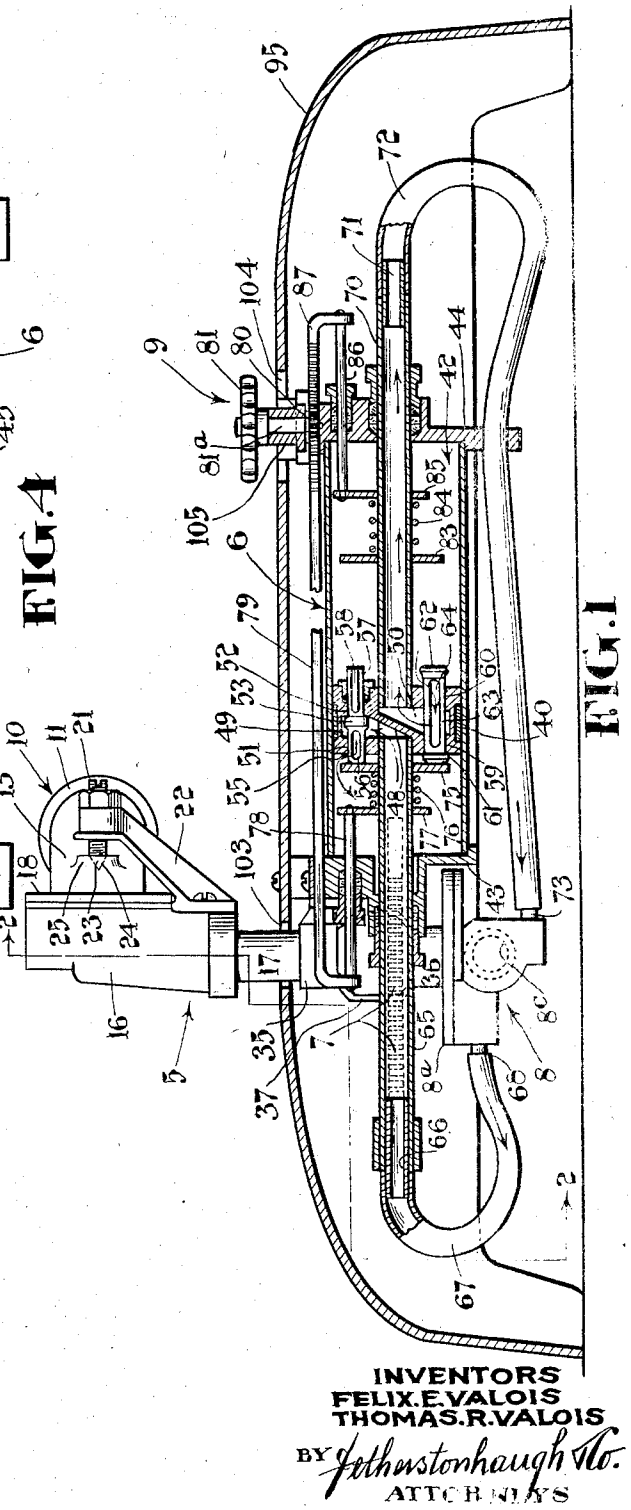


FIG. 1

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LAWN SPRINKLER

Filed Nov. 12, 1940 3 Sheets-Sheet 2

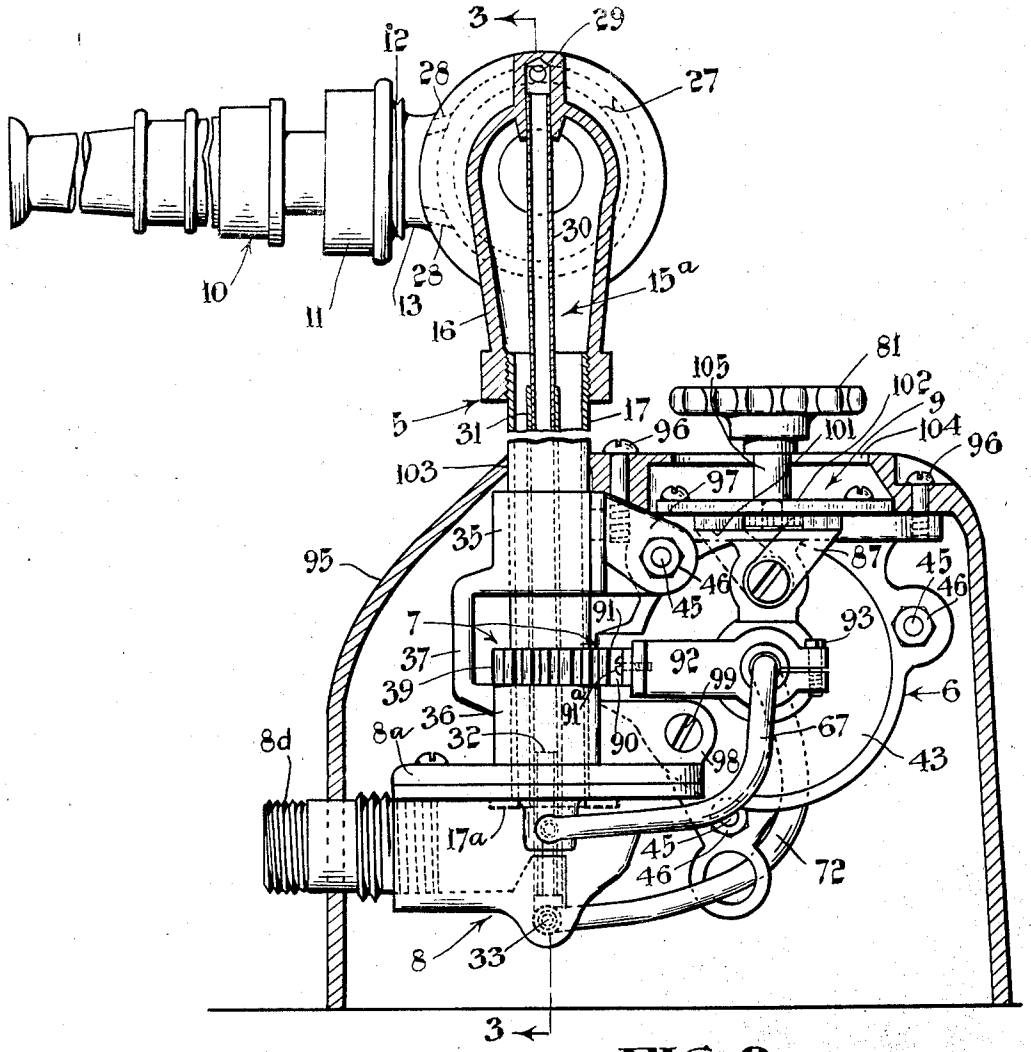


FIG. 2

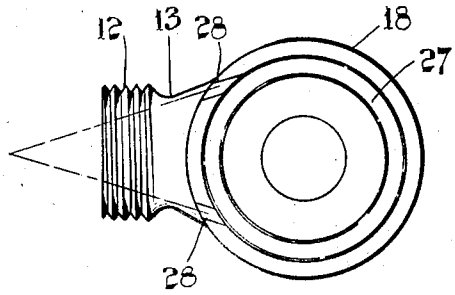


FIG. 5

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LAWN SPRINKLER

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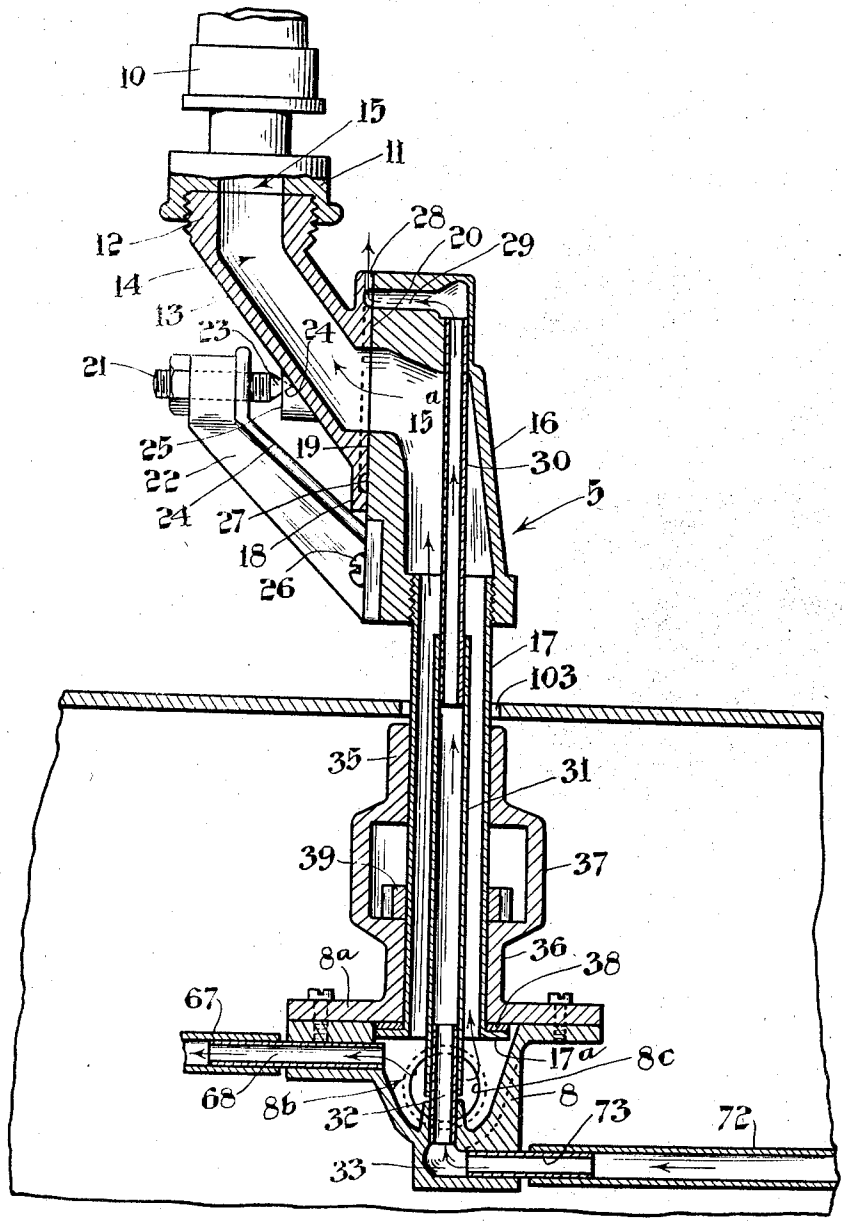


FIG. 3

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UNITED STATES PATENT OFFICE

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LAWN SPRINKLER

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Application November 12, 1940, Serial No. 365,248

4 Claims. (Cl. 299—66)

This invention relates to improvements in motor actuated lawn sprinklers of the oscillating nozzle type. Such sprinklers usually comprise a nozzle assembly mounted for oscillating movement, a water motor of the reciprocating piston type, motor driven nozzle oscillating mechanism connected between the nozzle assembly and the motor piston, and means for supplying water under pressure to the motor and to the flow passage and spray outlets of the nozzle assembly. In some cases means are also provided for varying the length of the arc through which the nozzle mechanism is oscillated in response to operation of the water motor.

A feature of the present invention consists in the provision of a generally improved motor actuated lawn sprinkler in which the nozzle assembly is designed to provide separate main and auxiliary fluid passages leading to separate main and auxiliary spray nozzles, the main nozzle being designed so that the spray or stream of water emanating therefrom is projected a considerably greater distance than the spray or stream emanating from the auxiliary nozzle. The advantage of this arrangement is that, for any given position of the sprinkler, the discharge emanating from the auxiliary nozzle covers an area close to the sprinkler which is overshot by the discharge emanating from the main nozzle.

Another feature of the invention consists in the provision of a sprinkler in which the exhaust water discharged from the water motor during operation thereof is utilized as the water supply for the auxiliary fluid passage and auxiliary spray nozzle of the nozzle assembly and in which the water supplied to the main fluid passage and main spray nozzle of the nozzle assembly is conducted directly thereto from the same source as that from which the water motor is supplied.

Another feature of the invention resides in the construction and arrangement of the water distributing chamber and connections through which water from a suitable source of supply is delivered to the motor and to the spray nozzles of the nozzle assembly.

A further feature of the invention resides in the provision of improved means for imparting oscillating movement to the nozzle assembly in response to operation of the water motor.

A still further feature of the invention resides in the provision of means whereby the length of the arc through which the nozzle assembly is oscillated is varied by regulating the effective stroke of the reciprocating motor piston by which the nozzle assembly is driven.

A still further feature of the invention resides in the provision of means whereby the effective stroke of the motor piston is regulated by advancing or retarding the reversal of suitable control valves which are carried by the piston of the water motor and are reversible to determine the direction of motion of the piston in response to the pressure of the water or motive fluid supplied to said motor.

The foregoing and other features and advantages of the invention, as well as the novel details of the embodiment selected for illustration will be more readily understood from the following detailed description and accompanying drawings, in which—

Fig. 1 is a view partly in longitudinal section and partly in elevation of my improved automatic sprinkler.

Fig. 2 is a sectional view taken substantially along the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 2. In this figure the nozzle member is shown turned to a different position as compared with Fig. 2.

Fig. 4 is an enlarged detail view showing the motor actuated rack and pinion mechanism for oscillating the nozzle assembly and component parts of the regulating mechanism provided for varying the length of the arc through which the nozzle is oscillated by the motor actuated rack and pinion mechanism.

Fig. 5 is a detail view of one of the component elements of the nozzle assembly.

As shown to advantage in Figs. 1 and 2, our improved sprinkler comprises an oscillatable nozzle assembly 5, a water motor 6, a motor driven rack and pinion mechanism 7 for oscillating the nozzle assembly 5 in response to operation of the motor 6, a water distributing casing 8 through which water under pressure is supplied to the motor and nozzle assembly through suitable connections hereinafter referred to; and a regulating mechanism 9 by which the operation of motor 6 is regulated to vary the length of the arc through which the nozzle assembly 5 is oscillated by the rack and pinion mechanism 7.

The nozzle assembly 5 comprises a conventional garden hose nozzle 10 provided with a screw threaded coupling member 11 which is screwed onto the threaded end 12 of a substantially elbow-shaped fitting 13. The bore 14 of fitting 13 provides a connecting passage between the main flow passage 15 of nozzle 10 and an elbow-shaped flow passage 15a, provided in a housing 16 which is threaded onto the upper end of a

rotatably mounted pipe 17. In this connection it will be noted that the end of the fitting 13 remote from nozzle 10 is provided with an outwardly directed circular flange 18 provided with a flat face 19 which bears against a flat face 20 provided at one side of housing 16. Fitting 13 is held in assembled relation with housing 16 by a retaining screw 21 which provides a pivot about which fitting 13 may be turned relative to housing 16 to point the nozzle 10 in various directions. As here shown, screw 21 is adjustably mounted in the upper end of a bracket 22 so that the central axis of the screw substantially coincides with the central axis of the flange 18, the inner end of said screw being shaped to provide a tapered portion 23 fitting in a tapered socket 24 provided in a boss 25 formed integral with the fitting 13. The lower end of the screw supporting bracket 22 is fastened to the lower portion of the housing 16 by a screw 26 or other suitable fastening means. The flat face 19 of the flange 18 is grooved to provide a circular channel 27 and a pair of ports 28, the latter extending from the channel 27 to the outer periphery of the flange and being inclined so that they converge toward their outer ends. The channel 27 is in communication with one end of a horizontal port 29 provided in the upper portion of the housing 16. The opposite end of port 29 communicates with the upper end of a rigid metal tube 30 which extends downwardly through the main flow passage 15*a* of housing 16. The lower end of tube 30 is connected by a flexible rubber tube 31 and a rigid metal nipple 32 to the inner end of a horizontal port 33 provided in the bottom wall portion of the water distributing casing 8.

The pipe 17 of nozzle assembly 5 rotates in the bearing sleeves 35 and 36 of a bracket 37 cast integral with the removable cover 8*a* of casing 8. The lower end of pipe 17 extends downwardly through a central opening in cover 8*a* and is provided with an outwardly directed flange 17*a*. A sealing washer 38 (see Fig. 3) is confined between the flange 17*a* and the cover 8*a*. A pinion 39 is fixed to the pipe 17 so that it rests on the upper end of bearing sleeve 36 and supports the pipe against downward movement. As clearly shown in Fig. 3, the bore of pipe 17 provides a connecting conduit between the chamber 8*b* of casing 8 and the water passage 15*a* of casing 16 whereby a portion of the water supplied to chamber 8*b* through inlet 8*c* is conducted through pipe 17 and water passages 15*a* and 14 to the main water passage 15 of nozzle 10.

The water motor 6 comprises a reciprocating piston 40 working in a cylinder 42 equipped with removable end heads 43 and 44 which are clamped against the ends of the cylinder by conventional tie rods 45 and clamping nuts 46. The piston 40 is provided with an internal partition 48 dividing the interior of the piston into two separate chambers comprising a pressure chamber 49 and an exhaust chamber 50. The pressure chamber 49 is adapted to be alternately placed in communication with the cylinder space at opposite sides of the piston by means of suitable openings 51 and 52 controlled by a valve 53, said valve being provided with a stem portion 55 working in the opening 51 and provided with ports 56 and with a second stem portion 57 working in the opening 52 and provided with ports 58. The exhaust chamber 50 is also adapted to be alternately placed in communication with the cylinder space at opposite sides of piston 40 by means of openings 59 and 60 controlled by valves 61 and 62 which are rigidly connected together by a guide member 63 which works in the openings 59 and 60 and is provided with ports 64. The pressure chamber 49 of piston 40 is also provided with a water inlet opening in which is fixed the inner end of a rigid metal tube 65 which slides in the cylinder head 43. The outer end of tube 65 is connected by nipple 66, flexible rubber tube 67 and nipple 68 to the water chamber 8*b* of the water distributing casing 8. From this it will be apparent that a portion of the water supplied to chamber 8*b* through inlet opening 8*c* is delivered to the pressure chamber 49 of piston 40. From the pressure chamber 49 the water passes into the cylinder space at either the left or right hand side of piston 40 depending on the position of the valve 53. When this valve is in the position shown in Fig. 1, the water passes from pressure chamber 49 through ports 56 to the cylinder space at the left hand side of piston 40 and develops pressure in the left hand end of the cylinder which is sufficient to move the piston 40 to the right, it being assumed that valves 61 and 62 of the piston are also in the position shown in Fig. 1.

The exhaust chamber 50 of piston 40 is provided with an outlet opening in which is fitted the inner end of a rigid hollow tube 70 which slides through a central opening in the cylinder head 44. The outer end of tube 70 is connected by nipple 71, flexible tube 72, and nipple 73 to the port 33 of the water distributing casing 8. Assuming that valves 61 and 62 are in the positions shown in Fig. 1 and that the piston 40 is traveling toward the right, any fluid contained in the cylinder space at the right hand side of piston 40 will flow past the valve 62 and through ports 64 into the exhaust chamber 50 and from thence through pipe 70, tube 72, port 33, tubes 31 and 30 and port 20 to the channel 27 of flange 18 and from thence outwardly through the channel discharge ports 28, said ports 28 constituting spray openings which are auxiliary to the main spray openings of the nozzle 10.

A valve actuating disk 75, a valve actuating spring 76, and an abutment member 77 are slidably arranged on the tube 65 at the left hand side of piston 40 as shown in Fig. 1, the abutment member 77 being connected by a rod 78 to one end of rack member 79 which meshes with an actuating pinion 80 which is provided with an operating handle 81. Similarly, a valve actuating disk 83, a valve actuating spring 84 and an abutment member 85 are slidably arranged on the tube 70 at the right hand side of piston 40, the abutment member 85 being connected by a rod 86 to one end of a rack member 87 which also meshes with the pinion 80. As hereinafter explained the distance between the two abutments 75 and 85 determines the effective stroke of the piston 40 and this distance may be varied by turning the pinion operating handle 81 to slide the abutments inwardly or outwardly on the tubes 65 and 70. Assuming the parts to be in the position shown in Fig. 1, water under pressure is supplied to the pressure chamber 49 of the piston through the tube 65 and flows through port 55 to the cylinder space at the left hand side of the piston. The water pressure thus developed in the left hand portion of the cylinder acts against both the piston 40 and the valve actuating disk 75 and serves to move these parts toward the right hand end of the cylinder. During this movement of piston 40 water previously

supplied to the right hand end of cylinder 42 flows past valve 62 and through port 64 into the piston chamber 50 and from thence through tubes 71 and 72, port 33, tubes 31 and 30, port 29 and channel 27 to the spray openings 28. As the piston 40 continues toward the right the valve stem 57 of valve 53 and the valve 62 engage the valve actuating disk 83 and move the latter to the right against the resistance of the spring 84 until the spring is compressed to the point where it exerts sufficient pressure against the disk 83 to cause the valve 53 and the valves 61 and 62 to be shifted to the left from the position shown in Fig. 1. When valve 53 is thus shifted to the left, it unseals the opening 52 and closes the opening 51. This disrupts communication between the pressure chamber 49 and the cylinder space at the left hand side of the piston and places said pressure chamber in communication with the cylinder space at the right hand side of the piston through port 58 so that pressure fluid now flows from chamber 49 to the right hand portion of the cylinder and acts against the valve actuating disk 83 and the right hand side of piston 40 to move these parts toward the left hand end of the cylinder. The aforesaid shifting of valves 61 and 62 to the left results in the valve 62 sealing the opening 60 while the valve 61 moves to the left away from the opening 59. This disrupts the communication previously existing between the exhaust chamber 50 of the piston and the right hand portion of the cylinder and places said exhaust chamber in communication with the left hand portion of the cylinder. Consequently, during movement of the piston 40 to the left the fluid previously supplied to the left hand portion of the cylinder flows into exhaust chamber 50 through opening 59 and port 64 and leaves said chamber through the tube 70. As the piston 40 continues its travel to the left the valve actuating disk 75 moves against the spring 76 and compresses same against the abutment 77 until the pressure of the spring is increased to the point where it is effective to return the valves 53, 61 and 62 to the position shown in Fig. 1. From this it will be evident that the effective stroke of the piston 40 and the tubes 65 and 70 may be shortened or lengthened by moving the abutment members 77 and 85 toward or away from each other to advance or retard the reversal of the valves 53, 61 and 62.

The pinion 39 of the oscillating nozzle assembly 5 meshes with a rack bar 90 which slides in a guideway 91 provided in the cylinder head 43. One end of rack bar 90 is fastened by a screw 91*a* to the outer end of a laterally projecting arm 92 having its opposite end removably clamped to the piston actuated tube 65 as indicated at 93. It will thus be seen that nozzle 10 and elbow fitting 13 of nozzle assembly 5 are oscillated in the arc of a circle by the turning movement imported to pipe 17 by the above mentioned rack and pinion elements.

The nozzle 10 will usually be disposed in a horizontal position at right angles to the axis of the pipe 17 as shown to advantage in Figs. 1 and 2. It will be understood, however, that the nozzle 10 may be swung to a vertical position as shown in Fig. 3 or to any other desired position by turning the nozzle and the elbow fitting 13 about the pivotal axis afforded by the screw 21. In this connection it will be noted that the assembly of the elbow fitting 13 and the casing 16 is such that the convergent discharge ends of the auxiliary spray openings 27 will always be directed in the same general direction as the discharge nipple of the main nozzle 10.

Assuming nozzle 10 to be in the position shown in Figs. 1 and 2 and that it is desired to shorten or lengthen the arc through which the nozzle is oscillated in response to movement of the piston 40, this is accomplished by operating the pinion actuating handle 81 to vary the distance between the abutments 77 and 85 which control the effective stroke of piston 40 as previously explained.

The inlet opening 8*c* of the water distributing casing 8 is equipped with a nozzle 8*d* adapted to be connected to a pressure hose or any other suitable source of water under pressure. As previously explained part of the water thus supplied to the water distributing casing 8 passes directly through pipe 17 and water passages 15*a* and 14 to the main water passage 15 of nozzle 10 while another portion of the water supplied to casing 8 passes through the tubes 67 and 65 to the pressure chamber 49 of piston 40. During operation of piston 40 there is practically a continuous flow of exhaust fluid from the exhaust chamber 50 to the auxiliary nozzle openings 28 of the oscillating nozzle assembly 5.

In the preferred embodiment of this invention the motor 6, the motor driven rack and pinion mechanism 7, the water distributing casing 8, the bracket 37 and the regulating mechanism 9 are contained within a supporting housing generally indicated at 95. In this connection it will be noted that cylinder heads 43 and 44 of motor 6 are fastened to and supported from the top wall of casing 95 by suitable fastening screws 96. It will also be noted that bracket 37 is provided with upper and lower lugs 97 and 98 which are fastened to the cylinder head 43, the lug 97 being secured in place by the nut 46 of one of the previously mentioned tie bolts 45 while the lug 98 is secured in place by a fastening screw 99. The rack bars 79 and 87 of the regulating mechanism 9 slide in guideways 101 provided in the cylinder heads 43 and 44 and are held against vertical displacement by suitable retaining plates 102. The top wall of supporting casing 95 is provided with an opening 103 through which the upper portion of the pipe 17 extends and with a further opening 104 accommodating the spindle connection 81*a* provided between the handle 81 and the pinion 80 of the regulating mechanism 9. The spindle 81*a* is journalled in one of the retaining plates 102 and passes through a spacer sleeve 105 interposed between said plate and the handle 81.

Having thus described what we now conceive to be the preferred embodiment of this invention, what we claim is:

1. A sprinkler comprising an oscillatable nozzle assembly, a water motor including a cylinder and a piston operating therein, nozzle oscillating mechanism connected between the nozzle assembly and the piston of said motor and means for varying the effective stroke of said piston to thereby vary the angle of oscillation imparted to said nozzle assembly, said means comprising valves controlling the flow of water to and from opposite sides of said piston, means for reversing said valves to effect a reverse movement of the piston after the latter has travelled a predetermined distance in one direction, and means for advancing or retarding the reversal of said valves to thereby regulate the effective stroke of the piston.

2. A sprinkler comprising an oscillatable nozzle assembly, a water motor including a cylinder and a piston operating therein, means connected be-

tween the nozzle assembly and said piston and functioning to impart oscillating movement to the nozzle assembly in response to reverse movements of said piston, means for alternately supplying fluid to and exhausting fluid from the cylinder space at each side of said piston to alternately move the piston in opposite directions, said means including provision for varying the effective stroke of the piston to thereby vary the angle of oscillation imparted to the nozzle assembly.

3. A lawn sprinkler comprising an oscillatable nozzle assembly, a water motor including a cylinder and a piston operating therein, connections between the piston and the nozzle assembly adapted to oscillate the latter in response to reverse movements of the piston, said piston being internally partitioned to provide a pressure chamber and an exhaust chamber, means for supplying fluid under pressure to said pressure chamber, valve means for alternately placing said pressure chamber in communication with the cylinder space at either side of the piston, an exhaust conduit connected to said exhaust chamber, valve means for alternately placing said exhaust chamber in communication with the cylinder space at opposite sides of said piston, valve actuating means for operating said first mentioned valve means to place said pressure chamber in communication with the cylinder space at one side of the piston when the latter reaches a definite point in its travel in one direction and to place said pressure chamber in communication with the cylinder space at the opposite side of the piston when the latter reaches a definite point in its travel in the opposite direction, said valve actuating means also serving to operate the second mentioned valve means so that the exhaust chamber of the piston will always be in communication with the cylinder space at the side of the piston remote from the cylinder space which is in communication with said pressure chamber, and means for adjusting said valve actuating means to regulate the distance travelled by the piston between the reversals of said valve means whereby the effective stroke of the piston is operable to vary the angle of oscillation imparted to the nozzle mechanism.

4. A sprinkler as set forth in claim 3 including manually operable rack and pinion mechanism for adjusting said valve actuating mechanism.

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